LTC3630AEDHC
High Efficiency High Voltage 500mA Synchronous Step-Down Converter

DESCRIPTION

Demonstration circuit 1877A is a 500mA output DC/DC power supply featuring LTC®3630A (DFN package), with 4V to 76V input range. The LTC3630A operates in a high efficiency Burst Mode® operation and includes internal high and low side switches. The board provides jumper selected output voltages of 1.8V, 3.3V, 5V and an option for additional voltages. LTC3630A has internal soft-start and a provision for increasing soft-start time.

Included on the board is an ON/OFF jumper that can also be configured as a precision undervoltage lockout. Additional pc pads are included for programming current limit to optimize efficiency and for reducing output voltage ripple and reducing component size. A terminal (FBO) is available to allow multiple boards to be paralleled for increasing output current.

Output voltage between 800mV and V_{IN} can be programmed using optional resistors. (Higher voltage output capacitors may be required.)

The LTC3630A data sheet gives a complete description of the operation and application information. The data sheet must be read in conjunction with this demo manual.

Design files for this circuit board are available at http://www.linear.com/demo/DC1877A

PERFORMANCE SUMMARY

Table 1. Specifications are at T_A = 25°C

PARAMETER	CONDITION	VALUE
Input Voltage Range	(1.8V, 3.3V Outputs)	4V to 76V
1.8V Output	V_{IN} = 76V, I_{OUT} = 500mA	1.8V ±2%
3.3V Output	V_{IN} = 76V, I_{OUT} = 500mA	3.3V ±2%
5V Output	V_{IN} = 76V, I_{OUT} = 500mA	5V ±2%
Maximum Output Current	V_{IN} = 76V, V_{OUT} = 5V	500mA
Typical Output Voltage Ripple	V_{IN} = 76V, V_{OUT} = 5V	84mV_{P-P}
Typical Efficiency		(See Figure 3)

QUICK START PROCEDURE

This demonstration circuit 1877A can be evaluated using the setup shown in Figure 1.

1. Connect the DVMs to the input and output. Select 5V setting using jumper JP1 (B position) and JP2 (A position), select ON position for JP3.
2. With input power supply set for 0V, connect the supply to V_{IN} and GND terminals using short (less than 10 inches) leads, preferably twisted leads. Connect a suitable load to V_{OUT} and GND terminals.
3. Slowly increase the input power supply to 10V. Observe output voltage and verify that it meets the specifications in Table 1. Measure output voltage with and without the load.
4. Move jumpers JP1 and JP2 to the other two fixed voltage settings and verify that each output voltage meets the values as shown in Table 1.
5. Once the proper output voltages are established, adjust the load and input voltage within the operating range and observe the output voltage regulation, ripple voltage and other parameters.

Notes:

1. IMPORTANT: 60V or higher voltage can result in an electric shock if care is not taken. Also, hot plugging the circuit to a power supply that has more than 40V present at its output can produce a high voltage transient exceeding the absolute maximum input voltage which can damage the LTC3630A.
2. When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the V_{IN} or V_{OUT} and GND terminals. See Figure 2 for proper scope probe technique.

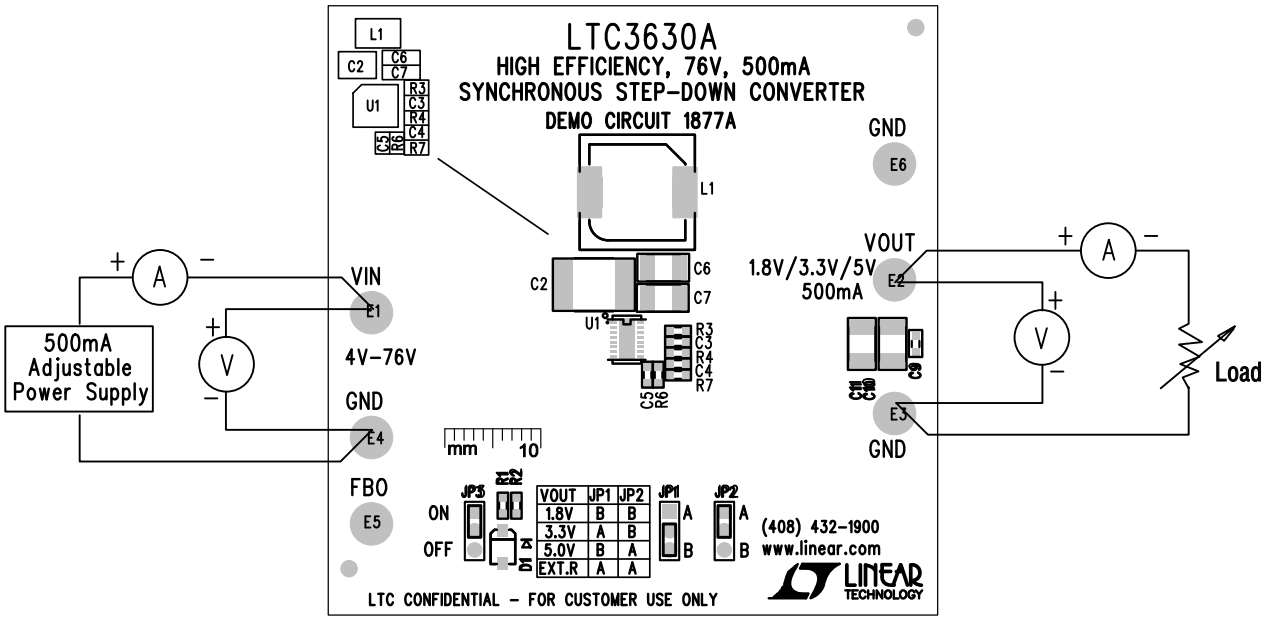


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

Circuit Options

Detailed information is contained in the data sheet.

Optional Output Voltage: Additional output voltages can be programmed by selecting proper resistors for the R6 and R7 feedback network. C5 is a feedforward capacitor to optimize transient response and increase stability. Both JP1 and JP2 must be in A position if R6 and R7 are used. The 10V rated output capacitors should be replaced with suitable voltage ratings.

ISET Components: C3, R3 and R4 are used to provide a number of features and circuit enhancements such as, output current limit, input current limit, optimizing output ripple voltage reduction and efficiency improvement. R4 sets maximum output current, see Figure 2 in LTC3630A data sheet, leave open for maximum load current. R3 and R4 can be used to set input current limit. C3 is used to reduce output voltage ripple and optimize efficiency. See data sheet for details.

RUN Pin Components: The converter is enabled when the RUN pin voltage exceeds 1.21V and is disabled when dropping below 1.1V. Pulling the RUN pin below 700mV forces a low quiescent current shutdown. Moving JP3 to the ON position allows an internal current to pull the RUN pin up to 5V. R1 and R2 are used to program input undervoltage lockout. Select suitable resistors to divide the input voltage down to the precision threshold voltage levels that enable and disable the converter. Note that the maximum voltage on the RUN pin is 6V, therefore a nominal 5V zener diode (D1) is required to limit the RUN pin voltage when high input voltages are used.

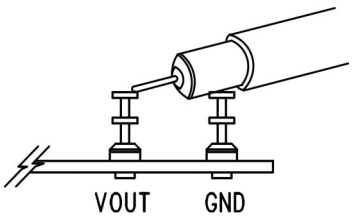
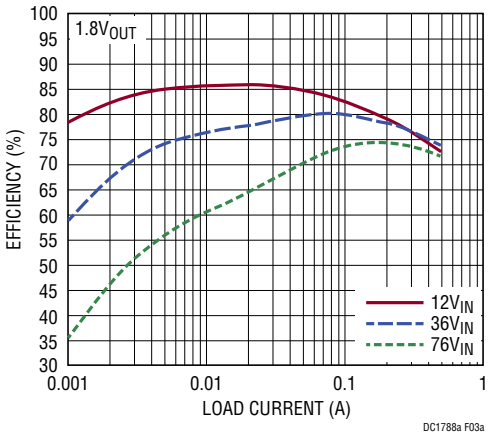
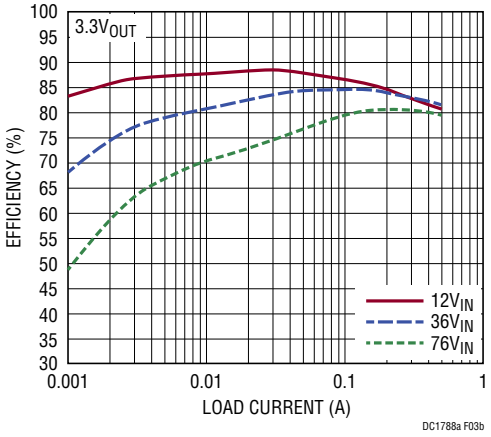


Figure 2. Measuring Input or Output Voltage Ripple





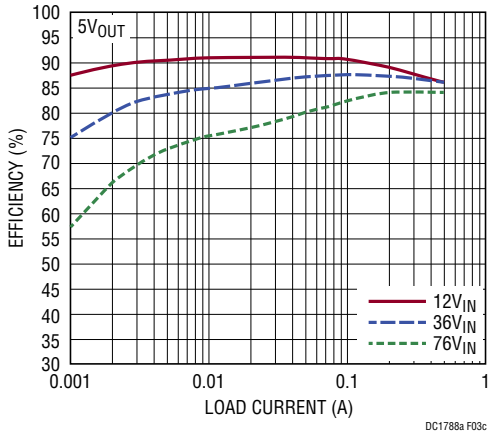
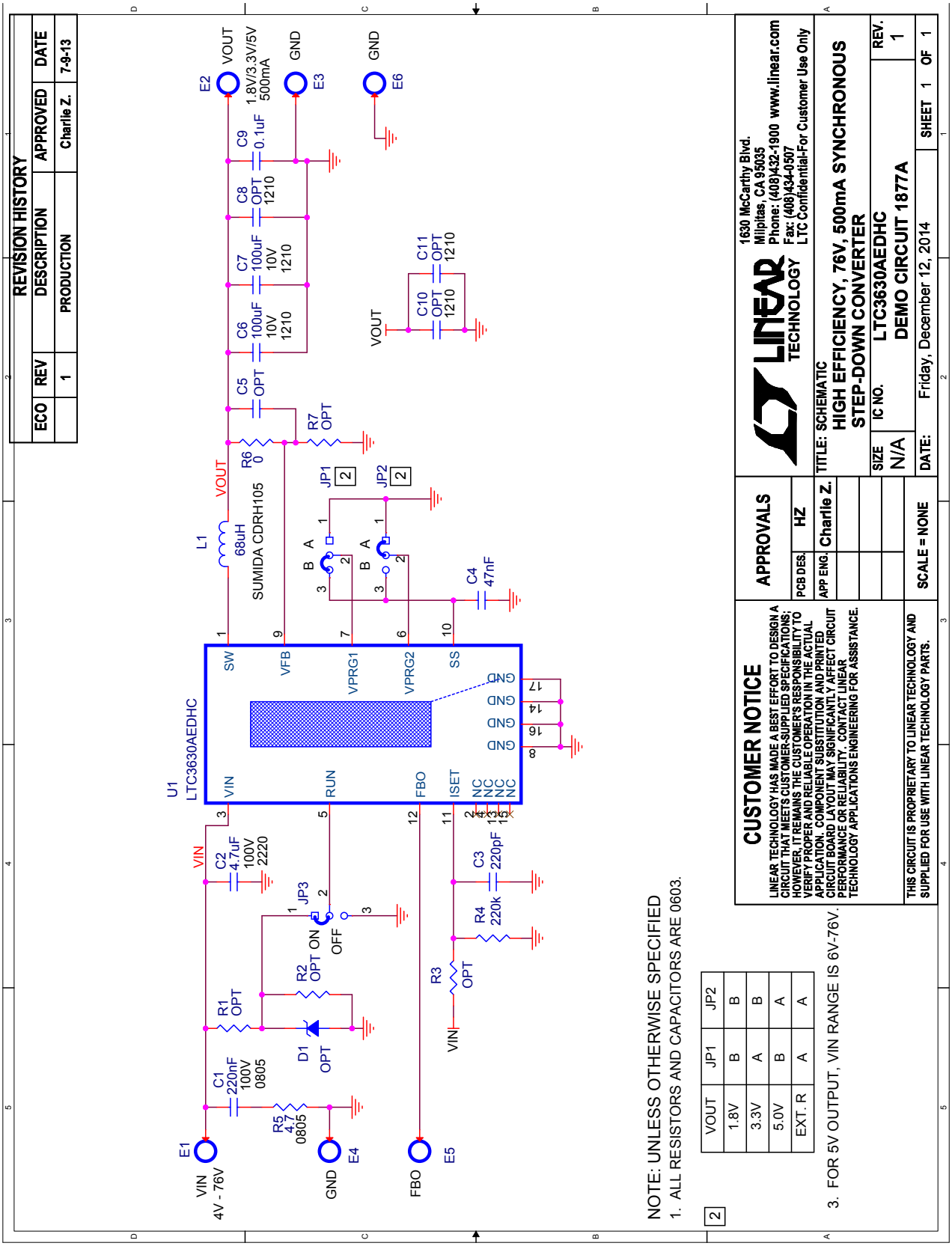


Figure 3. Efficiency Curves

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	C1	CAP, 0.22µF, X7R, 100V, 10%, 0805	MURATA, GRM21AR72A224KAC5L
2	1	C2	CAP, 4.7µF, X7R, 100V, 20%, 2220	TDK, C5750X7R2A475M230KA
3	1	C3	CAP, 220pF, X7R, 50V, 10%, 0603	AVX, 06035C221KAT2A
4	1	C4	CAP, 0.047µF, X7R, 25V, 10%, 0603	AVX, 06033C473KAT2A
5	2	C6, C7	CAP, 100µF, X5R, 10V, 20%, 1210	MURATA, GRM32ER61A107ME20L
6	1	C9	CAP, 0.1µF, X7R, 25V, 10%, 0603	AVX, 06033C104KAT2A
7	1	L1	IND, POWER, 68µH, 1.6A, 30%, SMD	SUMIDA, CDRH105RNP-680NC
8	1	R4	RES, 220k, 1/10W, 5%, 0603	VISHAY, CRCW0603220KJNEA
9	1	R5	RES, 4.7Ω, 1/8W, 5%, 0805	VISHAY, CRCW08054R70JNEA
10	2	R6	RES, 0Ω, 1/10W, 0603	VISHAY, CRCW06030000Z0EA
11	1	U1	IC, LTC3630AEDHC, DFN 5mm x 3mm	LINEAR TECHNOLOGY, LTC3630AEDHC#PBF
Additional Demo Board Circuit Components				
1	0	C5	CAP, OPTION, 0603	
2	0	C8, C10, C11	CAP, OPTION, 1210	
3	0	D1	DIODE, OPTION	
4	0	R1, R2, R3, R7	RES, OPTION, 0603	
Hardware: For Demo Board Only				
1	6	E1, E2, E3, E4, E5, E6	TEST POINT, TURRET, 0.094" MTG. HOLE	MILL-MAX, 2501-2-00-80-00-00-07-0
2	3	JP1, JP2, JP3	CONN, HEADER, 1 x 3, 2mm	SAMTEC, TMM-103-02-L-S
3	3	JP1, JP2, JP3	SHUNT, 2mm	SAMTEC, 2SN-BK-G
4	1		PCB, DC1877A	DEMO CIRCUIT 1877A
5	2		STENCIL, DC1877A (TOP AND BOTTOM)	STENCIL DC1877A

SCHEMATIC DIAGRAM



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